

ANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

III SEMESTER B.TECH. (CIVIL ENGINEERING)

END SEMESTER MAKE UP EXAMINATIONS, DEC 2017

SUBJECT: ENGINEERING MATHEMATICS-III [MAT 2104]

REVISED CREDIT SYSTEM (28/12/2017)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

✤ Answer ALL the questions.

✤ Missing data may be suitable assumed.

1A.	The diameter of an electric cable, say <i>X</i> is assumed to be a continuous random variable with pdf $f(x) = \begin{cases} kx(1-x) & 0 \le x \le 1\\ 0 & elsewhere \end{cases}$ i. Find the value of <i>k</i> ii. Compute the probability $P(X \le \frac{1}{2} \frac{1}{3} < X < \frac{2}{3})$ iii. Compute $E(X)$	4	
1B.	Evaluate $\int_{C} xydx + xy^2dy$ by stokes theorem where C is the square in xy-plane with vertices (1,0), (-1,0), (0,1) and (0,-1).	3	
1C.	Out of the digits 0, 1, 2, 3, 4 (without repetition), a 5-digit number is formed. Find the probability that the number is divisible by 4?	3	
2A.	If X, Y and Z are uncorrelated random variables with standard deviation 5, 12 and 9 respectively. If $U = X + Y$ and $V = Y + Z$, evaluate the correlation coefficient between U and V.		
2B.	Obtain the half range cosine series expansion of $f(x) = x$, $0 < x < 2$	3	
2C.	An officer has 4 assistants handling respectively 20%, 60%, 15% and 5% of the files of government reports. The probability that they misfile such reports are respectively 0.05,0.1,0.1 and 0.05. Find the probability that the misfiled report can be blamed on the first assistant.	3	
3A.	Expand the given function as Fourier series $f(x) = \begin{cases} 2-x & 0 \le x \le 4 \\ x-6 & 4 \le x \le 8 \end{cases} in f(x+8) = f(x)$ Hence evaluate $\sum_{n=1}^{\infty} \frac{1}{(2n-1)^2}$	4	

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3B.	Show that $\vec{F} = (x^2 + xy^2)\hat{i} + (y^2 + x^2y)\hat{j}$ is irrotational vector field. Find the scalar potential.	3
3C	Find the solution of the partial differential equation $u_{xy} - u_{yy} = 0$ using the transformations $v = x$ and $z = x + y$.	3
4A.	Verify Green's theorem in the plane for $\oint_C (xy + y^2)dx + y^2dy$ where C is the curve of the region bounded by $y = x$ and $y = x^2$	4
4B.	Solve $x^2 \frac{\partial u}{\partial x} + y^2 \frac{\partial u}{\partial y} = 0$ by the method of separation of variables.	3
4C.	Find the directional derivative of $\emptyset = x^2yz + 4xz^2$ at $(1, -2, -1)$ in the direction $a = 2i - j - 2k$.	3
5A.	State the assumptions and derive one dimensional wave equation.	4
5B.	Find the Fourier transform of $f(x) = e^{-a^2x^2}$.	3
5C.	Prove that $\nabla^2(\frac{1}{r}) = 0$	3